What is claimed is:

1. A method for forming a multi-layer wiring structure, comprising the following steps:

etching via-holes or wiring gutters through a resist mask on an insulating film between layers of silica system having dielectric constant being equal to or less than 3.5;

filling up said wiring gutters or said via-holes with conductive material; and

performing an ashing process on said resist mask using oxygen gas plasma under an atmospheric pressure from 0.01 Torr to 30.0 Torr.

2. A method for forming a multi-layer wiring structure, as described in the claim 1, wherein after forming said wiring gutters or said via-holes, a damascene method is used to fill up said wiring gutters or said via-holes with the conductive material.

3. A method for forming a multi-layer wiring structure, as described in ~~claim 1 or 2,~~ claim 1 wherein said insulating film between layers of silica system contains carbon from 5% by atomic weight to 25% by atomic weight.

4. A method for forming a multi-layer wiring structure, as described in the ~~claim 1, 2 or 3,~~ claim 1 wherein said insulating film between layers of silica system is formed by coating and baking a coating liquid including a chemical compound, being obtained through hydrolysis and condensation reaction of at least one kind of alkoxysilane compounds in organic solvent under presence of an acid catalyst, wherein said one kind of alkoxysilane compounds is selected from alkoxysilane compounds expressed by the

following general equation (I):

$$RnSi(OR^1)_{4-n} \quad \text{.....(I)}$$

wherein, R in the general equation (I) indicates an alkyl group having carbon number from 1 to 4 or an aryl group, R^1 indicates an alkyl group having carbon number from 1 to 4, and n indicates an integer from 1 to 2.

5. A method for forming a multi-layer wiring structure, as described in the claim 4, wherein said coating liquid contains hydrolysis co-condensate being obtained by reacting monoalkyl-trialkoxysilane from 2 mol to 6 mols with 1 mol of tetraalkoxysilane in the organic solvent in the presence of the acid catalyst.

6. A method for forming a multi-layer wiring structure, as described in the claim 4, wherein said coating liquid contains hydrolysis co-condensate being obtained by reacting tetraalkoxysilane from 0.5 mol to 4 mols and monoalkyl-trialkoxysilane from 0.5 mol to 4 mols with 1 mol of dialkyl-dialkoxysilane in the organic solvent in the presence of the acid catalyst.

7. A method for forming a multi-layer wiring structure, as described in claim 4, wherein said coating liquid contains hydrolysis condensate of a ladder type obtained from monoalkyl-trialkoxysilane.

8. A method for forming a multi-layer circuit board, as described in ~~claim 1 or 2~~ claim 1, wherein said insulating film between layers of the silica system is formed by coating with a coating liquid, and baking said coating liquid, which is obtained from a solution of a solvent of alkyleneglycol-dialkyl ether containing acid hydrolysis condensation product of trialkoxysilane, and which shows an increase in weight when

performing thermogravimetric measurement on a component forming the film after removing the solvent.